

# Complications of Pelvic Lymphadenectomy: Do the Risks Outweigh the Benefits?

Stacy Loeb, MD, Alan W. Partin, MD, PhD, Edward M. Schaeffer, MD, PhD

Brady Urological Institute, Johns Hopkins Medical Institutions, Baltimore, MD

*The American Urological Association Best Practice Policy states that although pelvic lymph node dissection (PLND) is commonly done with radical prostatectomy, its morbidity must be considered, particularly in cases in which it offers little additional information. The benefits of PLND include more accurate staging and reassurance for the patient. In addition, PLND may be therapeutic for men with lymph node metastases and may result in long-term biochemical cure for selected node-positive patients. However, the incidence of node positivity is declining, and accordingly a greater number of lymphadenectomies must be performed to benefit 1 patient. In addition to the associated cost, PLND has the potential for morbidity, including lymphoceles, thromboembolic events, ureteral injury, and neurovascular injury. Patients and physicians should therefore assess the risk/benefit ratio associated with PLND on an individual basis to permit informed treatment decisions.*  
[Rev Urol. 2010;12(1):20-24 doi:10.3909/riu0422]

© 2010 MedReviews®, LLC

---

**Key words:** Prostate cancer • Lymph node metastases • Pelvic lymph node dissection • Radical prostatectomy • Risk to benefit ratio • Lymphocele • Thromboembolic events • Vascular injury • Nerve injury • Ureteral injury

Pelvic lymph node dissection (PLND) is the gold standard for the detection of occult nodal metastases from prostate cancer. The traditional dissection includes the removal of nodal tissue between the external iliac vein and obturator nerve, extending laterally to the pelvic sidewall. However, a more extended approach is performed at many institutions. Both the lymph node yield<sup>1</sup> and the risk of complications<sup>2</sup> are highly dependent on the extent of PLND. The most

common complications after PLND are lymphocele formation, thromboembolic events, vascular injury, nerve injury, and ureteral injury. In addition to the potential for morbidity, PLND adds an estimated \$900 to \$3000 to the cost of radical prostatectomy, both for the additional operative time and pathologic consultation fees.<sup>3,4</sup>

As the frequency of nodal metastases has precipitously declined during the prostate-specific antigen (PSA) era, it is possible that the risk to benefit ratio of PLND may have changed. This article reviews the complications associated with PLND in an effort to better delineate the potential advantages and disadvantages associated with this procedure in the contemporary era.

### Potential Benefits of Pelvic Lymphadenectomy

Important advantages of PLND are accurate staging and patient peace of mind. In the 1970s and 1980s, as many as 20% to 40% of patients with apparently localized prostate cancer had positive lymph nodes.<sup>5</sup> However, this fraction has decreased to less than 4% today, corresponding to the widespread use of PSA-based screening. Using the D'Amico risk groups,<sup>6</sup> Kawakami and colleagues<sup>7</sup> reported lymph node metastases in 0.87% of low-risk, 2.0% of intermediate-risk, and 7.1% of high-risk patients.

Correspondingly, fewer pelvic lymph node dissections are being performed in the community than in the past. According to observational data from the Cancer of the Prostate Strategic Urologic Research Endeavor, 94% of radical prostatectomy patients underwent PLND from 1992 to 1994, compared with only 80% by 2001.<sup>7</sup> The most substantial decreases occurred in the low- and intermediate-risk groups, whereas the rate of PLND among high-risk patients remained relatively stable over time.

There may also be a therapeutic benefit associated with PLND, although this subject remains controversial. Indeed, a proportion of patients with lymph node metastases may be cured with complete surgical excision alone. At a median of 7.1 years after radical prostatectomy and PLND, Messing and coworkers<sup>8</sup> re-

---

*A proportion of patients with lymph node metastases may be cured with complete surgical excision alone.*

---

ported that 17% of men with node-positive prostate cancer were alive with undetectable PSA in the absence of secondary therapy.

Several recent observational studies have also attempted to determine whether PLND has a therapeutic advantage. Allaf and colleagues<sup>1</sup> compared the cancer control outcomes between 1865 men who underwent limited PLND and 2135 men who had a more extended PLND. Not surprisingly, patients in the extended PLND group had significantly more nodes removed, and a significantly greater proportion had lymph node metastases. There was a nonsignificant trend toward improved biochemical survival rates among men who had a more extensive lymph node dissection. Because of the small number of men with lymph node metastases in both groups, it is possible that there was not enough power to detect a statistical difference.

Using a different study design, Berglund and associates<sup>9</sup> compared the outcomes of men who underwent a limited PLND with those of similar patients who did not have PLND at all. The primary outcome measure in this study was biochemical failure or the initiation of secondary therapy. At 5 years the failure-free rates were 74% and 70% in the PLND and no-PLND groups, respectively, a difference that was not statistically signifi-

cant. Stratified by D'Amico risk classifications, the failure-free rates were also similar between the groups. Weight and colleagues<sup>10</sup> likewise reported no difference in biochemical progression-free survival between men who underwent limited PLND versus no PLND ( $P = .3$ ). Nevertheless, because neither study was

prospectively randomized, it is possible that PLND was performed more frequently in patients with higher risk features. In this case, an alternate explanation is that the absence of a survival difference may instead represent a benefit from the node dissection.

If there is indeed a survival advantage associated with removal of positive regional lymph nodes, presumably the affected nodes must be contained within the PLND template. As discussed, a more extended PLND is associated with a higher likelihood of encountering positive lymph nodes but also a greater risk of complications. Unfortunately, lymphatic drainage from the prostate has considerable variability. Indeed, Mattei and associates<sup>11</sup> recently showed that only 38% of the primary lymph nodes were located within the obturator fossa, and even an extended PLND template may miss up to 33% of potential primary landing sites.

Finally, a substantial number of "unnecessary" lymphadenectomies must be performed to potentially improve the outcomes for a small fraction of patients. Klein and colleagues<sup>12</sup> estimated the number needed to treat (NNT) for PLND to prevent 1 clinical event. Assuming that removal of 100% of the primary lymph nodes causes a 15% decrease in the rate of clinical events, the NNT was 667 for patients with a 1%

likelihood of positive lymph nodes. By contrast, for men with a 10% likelihood of positive lymph nodes, the NNT was 67 to potentially “cure” 1 patient. Clearly, the preoperative probability of lymph node metastases should be an important consideration for clinical decision making regarding PLND.

### Complications of Pelvic Lymphadenectomy

Although PLND is generally considered a relatively benign procedure, several complications may occur and may vary considerably in their severity. In this section, we review the most frequent complications in detail, including the frequency, presentation, and management.

#### *Lymphocele*

Lymphoceles are lymph-filled collections without a distinct epithelial lining, caused by the disruption of efferent lymphatics during PLND.<sup>13</sup> Although they are among the most common complications from PLND, their presentation is highly variable. Patients may be asymptomatic, or present with pain, fever, genital or lower extremity edema, or urinary and gastrointestinal symptoms from mass effect on adjacent organs.

Several factors have been identified that may increase the risk of lymphocele after PLND. Surgical technique can contribute to lymphocele risk, such as the excessive use of diathermy.<sup>14</sup> Other important surgical factors are the extent of PLND (extended > limited) and, in particular, the disruption of the lymphatics overlying the external iliac artery. Other factors that have been associated with an increased lymphocele risk include prior radiation therapy and subcutaneous heparin.<sup>13</sup>

The initial description of lymphocele after urologic surgery was by

**Table 1**  
**Lymphocele Rates in Contemporary Radical Prostatectomy Series With Limited Versus Extended Pelvic Lymph Node Dissection**

Study	Limited	Extended
Allaf et al. <sup>1</sup>	—	3 (0.1)
Briganti et al. <sup>26</sup>	9 (4.6)	79 (10.3)
Clark et al. <sup>21</sup>	1 (0.8)	3 (2.4)
Heidenreich et al. <sup>19</sup>	9 (9)	9 (10.6)
Musch et al. <sup>2</sup>	29 (3.3)	41 (9.4)

Values are number represented as whole numbers with the percentage in parenthesis.

Basinger and Gittes in 1975.<sup>15</sup> In 1981, Sogani and colleagues<sup>13</sup> reported a 4.7% lymphocele rate among 187 patients who underwent PLND for either prostate or bladder cancer. Table 1 shows published rates of lymphocele formation in contemporary radical prostatectomy series, stratified by the extent of PLND. Although the borders of PLND varied somewhat between studies, it is clear that in each population a more extensive dissection was associated with a greater risk of lymphocele formation. It is also noteworthy that some groups performed routine sonography on all patients before discharge, which may have increased the diagnosis of clinically “insignificant” lymphoceles. Indeed, studies from the radiologic literature have reported much higher rates of subclinical lymphoceles when routine imaging was performed after PLND, irrespective of symptoms. For example, Spring and colleagues<sup>16</sup> reported a 22% rate of lymphoceles on routine ultrasound after open PLND for prostate cancer. Solberg and associates<sup>17</sup> instead performed routine computed tomography scans on 132 patients after PLND for prostate cancer. The overall rate of lymphoceles was 54%. Fortunately very few of these cases were 5 cm or larger, and even fewer caused any clinical consequence.

There are many different management options for lymphoceles. Small asymptomatic collections can be managed conservatively. Studies using this approach have demonstrated absorption over time with bed rest and antibiotics alone.<sup>16</sup> Another option is simple aspiration, although fluid reaccumulation may occur, and there is an associated risk of infection.<sup>13</sup> Sclerotherapy has also been described using various chemical agents, such as povidone-iodine, diatrizoate meglumine, and doxycycline. Surgical options include marsupialization into the peritoneal cavity, which may be performed using an open or laparoscopic approach. Finally, percutaneous drainage has become an increasingly popular form of management and is particularly useful in the setting of suspected infection.

#### *Thromboembolic Events*

Deep venous thrombosis and/or pulmonary embolism have been reported in approximately 0% to 8% of modern PLND series.<sup>18,19</sup> Particularly concerning is the association between lymphocele and an increased risk of thromboembolic events. For example, in the recent series by Musch and colleagues,<sup>2</sup> deep venous thrombosis and pulmonary embolism occurred in 8.3% and 2.8% of patients with

lymphoceles, respectively, compared with less than 1% of the patients without a lymphocele ( $P = .001$ ).

Further complicating this situation is the association between prophylactic heparin and a higher risk of lymphocele formation. Catalona and coworkers<sup>20</sup> reported lymphoceles in 38% of patients given mini-dose heparin, compared with only 3% of patients who did not receive heparin. The investigators suggested that heparin may increase the risk of lymphocele through a delay in the clotting of lymph.

Our institution does not use prophylactic heparin for average-risk patients undergoing radical prostatectomy with PLND. However, sequential compression devices and early ambulation should be encouraged to reduce the frequency of thromboembolic complications.

#### *Ureteral Injury*

The ureter is a retroperitoneal structure that enters the pelvis in the region of the bifurcation of the common iliac artery. Once over these vessels, it courses along the inferior-lateral pelvis into the bladder. Injuries to the ureter are a relatively infrequent complication of PLND, occurring in less than 1% of large series.<sup>2,19,21-23</sup> The type of PLND (open or laparoscopic) does not seem to impact the incidence of this rare injury. Extended lymph node dissection was associated with high complication rates

in a report by Stone and colleagues<sup>23</sup>; however, this association was not observed in other large series.<sup>1,19</sup>

Most ureteral injuries are recognized at the time of PLND.<sup>2</sup> Repair generally involves mobilization of the proximal end of the cut ureter with reimplantation into the bladder over a ureteral stent. Reimplantation into the base of the bladder is gener-

---

*The obturator nerve can sustain either a transection or crush injury during PLND.*

---

ally preferred, because this region of the bladder is more fixed than the dome, and there is less chance of ureteral kinking during bladder filling. The optimal type of reimplantation (refluxing or nonrefluxing) has not been well studied in this clinical setting. Precise dissection, identification of anatomic landmarks, and the avoidance of blind soft tissue clipping can reduce the risk of ureteral injury.

#### *Neurologic Injury*

The most common neurologic tissue injured in PLND is the obturator nerve. It provides sensory innervation to the skin on the medial aspect of the thigh, as well as motor innervation of the adductor muscles in the thigh. The obturator nerve enters the pelvis behind the iliac arteries, runs laterally along the pelvic sidewall, and exits via the obturator foramen.

The obturator nerve can sustain either a transection or crush injury during PLND. This is reported in 0 to 5.1% of recent series, with a higher frequency observed in several early series of laparoscopic PLND.<sup>22,23</sup> More recent, larger laparoscopic series have reported lower rates, similar to those in open series (0%-1.8%).<sup>24,25</sup> If recognized intraoperatively, the nerve

injury should be managed by either removing the suspect clip or reapproximating the severed nerve with fine (5-0 or 6-0) nonabsorbable suture. Postoperative management consists of intensive physical therapy.

#### *Vascular Injury*

The lymphatics that drain the prostate are surrounded by major vascular structures, including the external and internal iliac artery and vein. Nevertheless, vascular complications are relatively uncommon, and substantial blood loss due solely to injury of a major pelvic vessel during PLND has not been reported in most recent series.

The obturator vessels, which often run in parallel with the obturator nerve, may also be injured during the PLND. If such an injury is noted intraoperatively, ligation should be performed to prevent a delayed bleed.

### **Main Points**

- Pelvic lymph node dissection (PLND) is the gold standard for the detection of occult nodal metastases from prostate cancer. The traditional dissection includes the removal of nodal tissue between the external iliac vein and obturator nerve, extending laterally to the pelvic sidewall.
- Important advantages of PLND are accurate staging and patient peace of mind. There may also be a therapeutic benefit associated with PLND, although this subject remains controversial.
- The most common complications after PLND are lymphocele formation, thromboembolic events, vascular injury, nerve injury, and ureteral injury.

## Conclusions

The American Urological Association Best Practice Policy states that although PLND is commonly done with radical prostatectomy, its morbidity must be considered, particularly in cases in which it offers little additional information. Furthermore, patients with a PSA value < 10 ng/mL and Gleason score of ≤ 6 rarely have lymph node metastases, so it is appropriate to omit lymphadenectomy in this group.

The benefits of PLND include more accurate staging and reassurance for the patient. In addition, PLND may be therapeutic for men with lymph node metastases and may result in long-term biochemical cure for selected node-positive patients.

However, the incidence of node positivity is declining, and accordingly a greater number of lymphadenectomies must be performed to benefit 1 patient. In addition to the associated cost, PLND has the potential for morbidity, including lymphoceles, thromboembolic events, ureteral injury, and neurovascular injury. Patients and physicians should therefore assess the risk to benefit ratio associated with PLND on an individual basis to permit informed treatment decisions. ■

## References

1. Allaf ME, Palapattu GS, Trock BJ, et al. Anatomical extent of lymph node dissection: impact on men with clinically localized prostate cancer. *J Urol*. 2004;172(5 pt 1):1840-1844.
2. Musch M, Klevecka V, Roggenbuck U, Kroepfl D. Complications of pelvic lymphadenectomy in 1,380 patients undergoing radical retropubic prostatectomy between 1993 and 2006. *J Urol*. 2008;179:923-928; discussion 928-929.
3. Hövels AM, Heesakkers RA, Adang EM, et al. Cost-analysis of staging methods for lymph nodes in patients with prostate cancer: MRI with a lymph node-specific contrast agent compared to pelvic lymph node dissection or CT. *Eur Radiol*. 2004;14:1707-1712.
4. Campbell SC, Klein EA, Levin HS, Piedmonte MR. Open pelvic lymph node dissection for prostate cancer: a reassessment. *Urology*. 1995;46:352-355.
5. Fowler JE Jr, Whitmore WF Jr. The incidence and extent of pelvic lymph node metastases in apparently localized prostatic cancer. *Cancer*. 1981;47:2941-2945.
6. D'Amico AV, Whittington R, Malkowicz SB, et al. Biochemical outcome after radical prostatectomy, external beam radiation therapy, or interstitial radiation therapy for clinically localized prostate cancer. *JAMA*. 1998;280:969-974.
7. Kawakami J, Meng MV, Sadetsky N, et al. Changing patterns of pelvic lymphadenectomy for prostate cancer: results from CaPSURE. *J Urol*. 2006;176(4 pt 1):1382-1386.
8. Messing EM, Manola J, Sarosdy M, et al. Immediate hormonal therapy compared with observation after radical prostatectomy and pelvic lymphadenectomy in men with node-positive prostate cancer. *N Engl J Med*. 1999;341:1781-1788.
9. Berglund RK, Sadetsky N, DuChane J, et al. Limited pelvic lymph node dissection at the time of radical prostatectomy does not affect 5-year failure rates for low, intermediate and high risk prostate cancer: results from CaPSURE. *J Urol*. 2007;177:526-529; discussion 529-530.
10. Weight CJ, Reuther AM, Gunn PW, et al. Limited pelvic lymph node dissection does not improve biochemical relapse-free survival at 10 years after radical prostatectomy in patients with low-risk prostate cancer. *Urology*. 2008;71:141-145.
11. Mattei A, Fuechsel FG, Bhatta Dhar N, et al. The template of the primary lymphatic landing sites of the prostate should be revisited: results of a multimodality mapping study. *Eur Urol*. 2008;53:118-125.
12. Klein EA, Kattan M, Stephenson A, Vickers A. How many lymphadenectomies does it take to cure one patient? *Eur Urol*. 2008;53:13-15; discussion 18-20.
13. Sogani PC, Watson RC, Whitmore WF Jr. Lymphocele after pelvic lymphadenectomy for urologic cancer. *Urology*. 1981;17:39-43.
14. Abou-Elela A, Reyad I, Torky M, et al. Laparoscopic marsupialization of postrenal transplantation lymphoceles. *J Endourol*. 2006;20:904-909.
15. Basinger GT, Gittes RF. Lymphocyst: ultrasound diagnosis and urologic management. *J Urol*. 1975;114:740-745.
16. Spring DB, Schroeder D, Babu S, et al. Ultrasonic evaluation of lymphocele formation after staging lymphadenectomy for prostatic carcinoma. *Radiology*. 1981;141:479-483.
17. Solberg A, Angelsen A, Bergan U, et al. Frequency of lymphoceles after open and laparoscopic pelvic lymph node dissection in patients with prostate cancer. *Scand J Urol Nephrol*. 2003;37:218-221.
18. Raboy A, Adler H, Albert P. Extraperitoneal endoscopic pelvic lymph node dissection: a review of 125 patients. *J Urol*. 1997;158:2202-2204; discussion 2204-2205.
19. Heidenreich A, Varga Z, Von Knobloch R. Extended pelvic lymphadenectomy in patients undergoing radical prostatectomy: high incidence of lymph node metastasis. *J Urol*. 2002;167:1681-1686.
20. Catalona WJ, Kadmon D, Crane DB. Effect of mini-dose heparin on lymphocele formation following extraperitoneal pelvic lymphadenectomy. *J Urol*. 1980;123:890-892.
21. Clark T, Parekh DJ, Cookson MS, et al. Randomized prospective evaluation of extended versus limited lymph node dissection in patients with clinically localized prostate cancer. *J Urol*. 2003;169:145-147; discussion 147-148.
22. Kavoussi LR, Sosa E, Chandhoke P, et al. Complications of laparoscopic pelvic lymph node dissection. *J Urol*. 1993;149:322-325.
23. Stone NN, Stock RG, Unger P. Laparoscopic pelvic lymph node dissection for prostate cancer: comparison of the extended and modified techniques. *J Urol*. 1997;158:1891-1894.
24. Gonzalzo ML, Pavlovich CP, Trock BJ, et al. Classification and trends of perioperative morbidities following laparoscopic radical prostatectomy. *J Urol*. 2005;174:135-139; discussion 139.
25. Lein M, Stibane I, Mansour R, et al. Complications, urinary continence, and oncologic outcome of 1000 laparoscopic transperitoneal radical prostatectomies-experience at the Charité Hospital Berlin, Campus Mitte. *Eur Urol*. 2006;50:1278-1282; discussion 1283-1284.
26. Briganti A, Chun FK, Salonia A, et al. Complications and other surgical outcomes associated with extended pelvic lymphadenectomy in men with localized prostate cancer. *Eur Urol*. 2006;50:1006-1013.